



January 5, 2006

Dan Najera Deputy State Fire Marshal 1311 S Street Sacramento, CA 9

RE: Workgroup 9, Mercantile Occupancies Code Amendment Recommendations

Dear Dan,

It has been a pleasure for us to function as the Co-Chairs to the Mercantile Occupancies Workgroup during this code adoption process. Members of this workgroup were energetic and have committed a great deal of time to develop suggestions for amendments to the new California Codes.

From October through December, Workgroup 9 conducted six meetings. At each meeting we conducted open and enthusiastic discussions about the many issues that are important to the life safety of our communities. After the discussion, votes to determine acceptance of proposed amendments were conducted following the guidelines established by the State Fire Marshal' Office. Only those amendments that met with the approval of the majority of the members voting were allowed to move forward.

The following pages contain express terms and purpose and rationale statements for twelve suggested amendments specific to group M Occupancies. Since some of our workgroup members were also members of other workgroups, you will be seeing some of these suggestions repeated in other workgroups.

Workgroup 9 will await further instructions and is standing-by if further discussion or clarification is needed regarding the proposed amendments that we have sent forward.

Sincerely,

Rick Bennett
Rick Bennett
Fire Marshal
City of Eureka

Mark Wood
Mark Wood
Building Official
City of Davis

and

### Purpose and Rationale Statement for Work Group 9:M Occupancies Section 406.7

#### **EXPRESS TERMS**

#### Add to Section 406 Motor-Vehicle-Related Occupancies

#### Definitions:

Electric Vehicle is an automotive-type vehicle for highway use, such as passenger automobiles, buses, trucks, vans and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array or other source of electric current. For the purpose of this code, electric motorcycles and similar type vehicles and off-road self-propelled electric vehicles such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats and the like, are not included

**Section 406.7 Electric Vehicle Charging** *In any building or interior area used for charging electric vehicles, electrical equipment shall be installed in accordance with the California Electrical Code.* 

406.7.1 Ventilation. Mechanical exhaust ventilation, when required by the California Electrical Code shall be provided at a rate as required by Article 625 or as required by Section 1203 of the International Building Code whichever is greater. The ventilation system shall include both the supply and exhaust equipment and shall be permanently installed and located to intake supply air from the outdoors, and vent the exhaust directly to, the outdoors without conducting the exhaust air through other spaces within the building.

**Exception:** Positive pressure ventilation systems shall only be allowed in buildings or areas that have been designed and approved for that application.

**406.7.2** Electrical Interface. The electrical supply circuit to electrically powered mechanical ventilation equipment shall be interlocked with the recharging equipment used to supply the vehicle(s) being charged, and shall remain energized during the entire charging cycle. Electric vehicle recharging equipment shall be marked or labeled in accordance with the California Electrical Code.

- **EXCEPTIONS:** 1. Exhaust ventilation shall not be required in areas with an approved engineered ventilation system, which maintains a hydrogen gas concentration at less than 25 percent of the lower flammability limit.
- 2. Mechanical exhaust ventilation for hydrogen shall not be required where the charging equipment utilized is installed and listed for indoor charging of electric vehicles without ventilation.

#### PURPOSE AND RATIONALE STATEMENT

(N) Add code language to the model code that is not currently addressed. Federal and State legislation encourage the use of zero pollution vehicles in the public and private sectors. The State of California encourages the sale and use of electric vehicles through legislation and incentives. Electric Vehicle charging stations can be installed in any occupancy, including residential, commercial, retail and public buildings. The Office of the State Fire Marshall amended the 1998 California Building Code to include provisions for the installation of electric vehicle charging stations. These provisions are in the current code but not in the proposed code. The following provisions are recommended for adoption into the model code to provide an equivalent level of protection to the current State Code.

and

Purpose and Rationale Statement for Work Group 9:M Occupancies Sections 504.2/506.3/506.4

#### **EXPRESS TERMS**

**504.2 Automatic sprinkler system increase.** Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the maximum number of stories is increased by one. **Exceptions:** 

- 1. Fire areas with an occupancy in Group I-2 of Type IIB, III, IV or V construction.
- **1** 2. Fire areas with an occupancy in Group H-1, H-2, H-3 or H-5.
- **1** 3. Fire-resistance rating substitution in accordance with Table 601, Note e.
- 4. This increase is not allowed where additions to area increase in Section 506.3 is used.
- **506.3 Automatic sprinkler system increase.** Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the area limitation in Table 503 is permitted to be increased by an additional 100 percent ( $I_s = 1$ ) for buildings with more than one story above grade plane and an additional 200 percent ( $I_s = 2$ ) for buildings with no more than one story above grade plane. **Exception:** The area limitation increases shall not be permitted for the following conditions:
  - 1. The automatic sprinkler system increase shall not apply to buildings with an occupancy in Use Group H-1.
  - 2. The automatic sprinkler system increase shall not apply to the floor area of an occupancy in Use Group H-2 or H-3. For mixed-use buildings containing such occupancies, the allowable area shall be calculated in accordance with Section 508.3.3.2, with the sprinkler increase applicable only to the portions of the building not classified as Use Group H-2 or H-3.
  - **1** 3. Fire-resistance rating substitution in accordance with Table 601, Note e.
  - 4. These increases are not allowed in addition where Section 504.2 is used.
- **506.4** Area determination. The maximum area of a building with more than one story above grade plane shall be determined by multiplying the allowable area of the first story  $(A_a)$ , as determined in Section 506.1, as listed below:

1. For buildings with multiple stories above grade plane, multiply by 2; 2. No story shall exceed the allowable area per story  $(A_a)$ , as determined in Section 506.1, for the occupancies on that story.

#### **Exceptions:**

1. Unlimited area buildings in accordance with Section 507.

#### PURPOSE AND RATIONALE STATEMENT

(SFM) The purpose of these proposed amendments to Sections 504.2, 506.3, and 506.4 of the 2006 IBC is to reasonably maintain the current level of fire/life safety provided by the CBC by reducing the allowable areas calculated for buildings based on construction type and occupancy classification. This is accomplished by lowering by 100% percent the increases permitted when automatic sprinkler systems are installed, by not allowing both an area increase and a story height increase when automatic sprinkler systems are installed, and by reducing the maximum area cap for buildings three stories or greater in height from three times the allowable area for a single story building to two times the allowable area for a single story without modifying the actual allowable area values in Table 503 of the 2006 IBC.

A detailed analysis of the maximum allowable heights and areas permitted by the IBC clearly shows that the IBC allows for much larger heights and areas for specified construction types than previously allowed in California by the CBC. In addition, the code provides formulas for increasing the heights and areas beyond what has been permitted in any of the other model codes in the country.

These formulas are proposed to be modified to restrict the accumulation of these increases for five important reasons:

- 1) the level of risk, due partially to population and seismic activity, is higher in California;
- 2) the increases are based on the successful operation of automatic sprinkler systems, however the operation of these systems may be compromised under certain circumstances;
- 3) the quantity and capability of emergency response resources is based on the infrastructure and building design that has existed in California for decades under the CBC. Therefore, it is felt that the level of fire and life safety would be decreased below what we have today in terms of allowable building size;
- 4) The time needed to research, qualify and justify deviations from model code which would substantially increase heights and areas is not available;
- 5) If we find, after appropriate research that increases to heights and areas are not warranted in the state of California, it would be very difficult to reduce these

numbers in the future and our fire losses would likely increase in the meantime as these larger buildings suffer fires.

It is important to note that the values in the heights and areas tables in all building codes provide artificial limits on building size. The heights and areas limitations in the IBC with the accumulated modifiers were developed in response to the need to not adversely impact the re-use of the existing building stock in those areas of the country under a previous legacy model code. Since the UBC contained the most conservative heights and areas limitations and the accumulation of such modifiers was not allowed, this action will not adversely impact the re-use of existing buildings in California. The modifiers have existed in every model code but no code has previously allowed the use of all modifiers for a single building as allowed by the IBC. Only experience can measure the increased level of risk.

#### **Express Terms**

and

Purpose and Rationale Statement for Work Group 9:M Occupancies Section 508.3 Mixed Occupancies

**EXPRESS TERMS** 

**508.3 Mixed occupancies.** Each portion of a building shall be individually classified in accordance with Section 302.1.

Where a building contains more than one occupancy group, the building or portion thereof shall comply with Sections 508.3.1 or 508.3.3 or a combination of these sections.

#### **Exceptions:**

1. Occupancies separated in accordance with Section 509.

**1** ■ 2. Where required by Table 415.3.2, areas of Group H-1, H-2 or H-3 occupancies shall be located in a separate and detached building or structure.

**508.3.1.3 Separation.** A separation is required between accessory occupancies and the main occupancy in accordance with Table 508.3.3.

**508.3.2** Reserved.

#### PURPOSE AND RATIONALE STATEMENT

(SFM) The purpose of this proposed amendment is to reasonably maintain the current level of fire/life safety provided by the CBC for buildings containing mixed occupancies by eliminating Section 508.3.2 Nonseparated Occupancies of the 2006 IBC as an acceptable option for addressing buildings containing more than one occupancy classification.

Section 508.3 Mixed Occupancies of the 2006 IBC treats mixed occupancies in buildings very similarly to the CBC with one significant exception. That exception is the nonseparated occupancies provided for in Section 508.3.2 which is proposed to be deleted. Basically, the nonseparated occupancies option allows mixed occupancies in buildings without a requirement that they be separated with fire-resistive construction in the form of fire barrier walls and horizontal assemblies.

However, the CBC does allow Group M Occupancies in buildings with other occupancies without a required fire-resistive occupancy separation provided the other occupancies are either a Group A-3, B, or F-1 Occupancy. Otherwise, the Group M Occupancy is required to be separated from all other occupancy classifications that may be in the building with fire-resistive occupancy separations. Similarly, under the separated occupancies option in Section 508.3.3 of the 2006 IBC, Group M Occupancies are not required to be separated with fire-resistive occupancy separations from Group B and F-1 Occupancies. However, the IBC does require the Group M occupancies to be separated from Group S-1 Occupancies but then provides exceptions based on Footnote b to Table 508.3.3 which are virtually the same as those exceptions allowed in CBC Section 309.2.2 for the same occupancy separations as the IBC. Therefore, deleting the nonseparated occupancy option in Section 508.3.2 of the IBC will make the IBC comparable to the CBC for the protection of separation of occupancies involving Group M Occupancies in buildings with multiple occupancies.

This makes sense since Group M Occupancies can have significantly high fire loads as well as high densities of occupants especially during peak holiday season shopping days.

They should be provided with the appropriate fire-resistive occupancy separations to protect not only the Group M Occupancy from the adjacent occupancies but also to protect the adjacent occupancies from the Group M Occupancy. Those occupancies for which the fire-resistive separation would be required by Section 508.3.3 of the IBC would include Groups A, E, I, and R Occupancies. These are all occupancies that have a high life safety risk which should be required to be separated from a Group M Occupancy. As indicated previously, Group M Occupancies can have high fire loads which can result in significant fires exposing such adjacent occupancies and the occupants therein. By providing fire-resistive occupancy separations between the Group M Occupancies and these life safety related occupancies, the occupants of the adjacent occupancies will have a reasonable degree of protection to provide them with adequate time to react to the fire in the adjacent Group M Occupancy and thus exit the building as needed without being exposed to untenable conditions. Or such separations allow the occupants to remain in place until the fire department arrives and either extinguishes the fire in the adjacent occupancy or takes appropriate search and rescue actions to find and relocate or evacuate the occupants, especially where they are not capable of relocating themselves.

and

## Purpose and Rationale Statement for Work Group 9:M Occupancies Section 704.5

#### **EXPRESS TERMS**

**704.5 Fire-resistance ratings.** Exterior walls shall be fire-resistance rated in accordance with Tables 601 and 602. The fire-resistance rating of exterior shall be rated for exposure to fire from both sides.

#### PURPOSE AND RATIONALE STATEMENT

(SFM) The purpose of this proposed amendment is to reasonably maintain the current level of fire/life safety provided by the CBC by requiring all exterior walls to have their required fire-resistance rating determined based on fire tests conducted with both sides of the wall independently tested in the ASTM E119 fire test method regardless of the fire separation distance. Presently, the IBC only requires this type of fire testing to be done if the fire separation distance is 5 feet or less.

This proposed amendment will also address concerns about significant seismic events followed by multiple fires coupled with the inability of the fire department to gain rapid access, or even any access, to buildings involved in those fires and the lack of adequate water supplies due to ruptured water mains. The proposed higher fire resistance ratings for exterior walls will help to contain and control such fires and prevent them from spreading to adjacent buildings. The exterior walls in those cases need to be able to not only contain a fire within the building of origin, but also to resist a fire exposure from an adjacent building, even if the fire separation distance is greater than 5 feet (but less than

30 feet) where exterior walls are required to have a fire-resistance rating. This will help to prevent conflagrations even if the fire department is unable to get to the scene because of blocked access or lack of adequate equipment or personnel caused by the excessive demands of a significant earthquake.

This amendment is even more critical for exterior bearing walls which, obviously, are also required to structurally support the buildings and maintain themselves in place while resisting fire exposure. Not only are they structurally critical but they are also serve to prevent fire spread from building to building. However, they may be exposed on the exterior by an interior fire breaking out of a door or window of an exterior wall, exposing the exterior wall to flame plumes on the outside while the interior side is being exposed to the same fire. Similarly, if an adjacent building exposure fire breaches a door or window opening in the exposed building, the fire would not only be exposing the exterior of the wall but also the interior as the fire gains a foothold within the building.

Requiring the exterior walls to be fire tested to resist fire exposure from both sides, regardless of the fire separation distance, would greatly improve the ability of exterior walls to remain in place and resist fire exposure while maintaining their structural integrity, even where fires are uncontrolled and the fire department does not have the ability to assist in fire containment during major earthquake disasters.

It is also important to note that the IBC allows unprotected openings in exteriors walls where the fire separation distance is greater than 5 feet for nonsprinklered buildings and where the fire separation distance is greater than 3 feet for sprinklered buildings. Whereas, the California Building Code (CBC) only allows unprotected openings in most cases where the fire separation distance is greater than 20 feet for other than Types II and V construction where the fire separation distance is greater than 10 feet. The CBC does not allow any openings for fire separation distances less than 5 feet. Thus, there is more potential under the IBC for a fire to spread from one building to another through unprotected openings in fire-resistance rated exterior walls which could also involve fire exposure to both sides of the exterior wall. Such situations indicate that the exterior walls should have their fire-resistance ratings determined based on fire test exposures from both the interior side and the exterior side as proposed by this amendment.

and

### Purpose and Rationale Statement for Work Group 9:M Occupancies Section 716.5.2

#### **EXPRESS TERMS**

**716.5.2 Fire barriers.** Ducts and air transfer openings of fire barriers shall be protected with approved fire and smoke dampers installed in accordance with their listing. Ducts and air transfer openings shall not penetrate exit enclosures and exit passageways except as permitted by Sections 1020.1.2 and 1021.5, respectively.

**Exception:** 1. Fire dampers are not required at penetrations of fire berriers where penetrations are tested in accordance with ASTM E 119 as part of the fire-resistance rated assembly.

2. Fire and smoke dampers are not required where ducts are used as part of an approved smoke control system in accordance with Section 909 and where the use of a fire or smoke damper would interfere with the operation of a smoke control system.



#### PURPOSE AND RATIONALE STATEMENT

**(SFM)** The purpose of this proposed amendment is to maintain the current level of fire/life safety provided by the CBC by requiring smoke dampers (in addition to the fire dampers currently required by the 2006 IBC) for all duct and air transfer openings in fire barriers. Fire barriers are defined in Section 706 and include the following applications:

Shaft Enclosures Exit Enclosures Exit Passageway Enclosures Horizontal Exits Incidental Use Area Separations Mixed Occupancy Separations Single Occupancy Fire Area Separations

The proposed amendment also deletes Exception 3 which permits a sprinkler trade-off for NFPA 13 and NFPA 13R systems which allows the omission of fire dampers where the fire barrier walls are not required to have a fire-resistance rating of more than 1 hour.

Currently, the IBC requires duct and air transfer opening penetrations of shaft enclosures to be protected with a smoke damper in addition to a fire damper in accordance with Section 716.5.3.1. It is also interesting to note that IBC Section 715.3.7.3 requires that where automatic closing devices are used for doors in horizontal exits, exits including exit stair enclosures and exit passageways, and incidental use areas, they must be activated by smoke detectors. In other words, the fusible link hold open devices are not allowed which are comparable to a fire damper which is also activated by a fusible link. It follows that if large door openings in these fire barriers are required to be automatic closing by smoke detectors that dampers in duct openings and air transfer openings in these fire barriers should also be activated by smoke detectors as required for a smoke damper (but not required for a fire damper).

Furthermore, mixed occupancy separations should also be protected by smoke dampers in order to minimize smoke exposure to the adjacent separated occupancies to maintain a tenable atmosphere for life safety purposes. Smoke can readily spread through openings protected only by fire dampers since the fire dampers may not close in the early stages of the fire or in areas remote from the fire where the smoke may pass through the ducts into the adjacent areas before they activate in order to close the opening. Even when fire dampers do activate, they are not designed to control the movement of smoke as are smoke dampers. In fact, they are extremely leaky and will allow significant quantities of smoke to pass through, especially at elevated temperatures. Smoke dampers are currently required by the CBC for duct and air transfer openings in occupancy separation walls so this would continue to maintain the present level of fire and life safety under the current code.

Regarding the automatic sprinkler trade-off to omit the smoke damper where ducts and air transfer openings penetrate fire barriers having a rating of not more than 1 hour, this trade-off would basically only apply to walls separating incidental use areas in accordance with Section 302.1.1 and virtually all mixed occupancy separations based on Table 508.3.3. Generally speaking, incidental use areas are considered more hazardous than the areas to which they are incidental to and require special separation and protection in order to contain a potential fire and prevent it from threatening the adjacent spaces, at least in the early stages of fire development. In most cases Table 302.1.1 which specifies the separation requirements for incidental use areas allows the option of a 1 hour separation or an automatic fire extinguishing system installed in the incidental use area. So there is no need to specify a trade-off in Section 715.3.7.3 as it is already provided for by eliminating the 1 hour fire barrier in Table 302.1.1 when an automatic fire extinguishing system (automatic sprinkler system) is provided.

This leaves the mixed occupancy separations which in sprinklered buildings are only required to have a maximum fire-resistance rating of 1 hour except for some special cases where Group H Occupancies are involved, as specified in Table 508.3.3. Thus, this tradeoff, in effect, would allow for the omission of fire dampers in sprinklered buildings containing mixed occupancies of other than Group H. The required fire and smoke damper in these mixed occupancy separations should not be traded off for an automatic sprinkler system which may not activate sufficiently early to prevent smoke transfer through a mixed occupancy separation. Even when they do activate, there will still be generation of smoke that will be allowed to pass through these duct and air transfer openings without any impedance if there are no dampers installed. Furthermore, should the sprinkler system fail to operate or operate inadequately or improperly, of course there will be large quantities of smoke generated which will be allowed to spread from one occupancy to another without any damper protection provided. Since recent NFPA studies have shown that automatic sprinkler systems in general fail to operate in one out of every six fires, it is not appropriate to provide such a sprinkler trade-off for the important fire protection features of fire and smoke dampers in the duct and air transfer openings in occupancy separation fire barrier walls.

This is even more critical in California where there is a significant probability of having a significant seismic event which would render the sprinklers inoperable or ineffective should a fire occur after the earthquake. Since the current CBC does not contain such a sprinkler trade-off, the elimination of this Exception will maintain the current level of fire and life safety provided in the state regarding the protection of duct and air transfer openings in occupancy separation fire barrier walls.

and

## Purpose and Rationale Statement for Work Group 9:M Occupancies Section 716.5.4.1

#### **EXPRESS TERMS**

**716.5.4.1 Corridors.** A listed smoke damper designed to resist the passage of smoke shall also be provided at each point a duct or air transfer opening penetrates a fire resistance rated corridor enclosure required to have smoke and draft control doors in accordance with Section 715.4.3.

#### **Exceptions:**

1. Smoke dampers are not required where ducts are used as part of an approved mechanical smoke control system designed in accordance with Section 909 and where the smoke damper will interfere with the operation of the smoke control system.

2. Smoke dampers are not required in corridor penetrations where the duct is constructed of steel not less than 0.019 inch (0.48 mm) in thickness and there are no openings serving the corridor.

#### PURPOSE AND RATIONALE STATEMENT

(SFM) The purpose of this proposed amendment is to maintain the current level of fire/life safety provided by the CBC by making it clear that the required smoke dampers for corridors, as specified in this Section, is in addition to the required fire damper specified in Section 716.5.4 for duct and air transfer openings in fire-resistance rated corridor walls. It also clarifies that the smoke damper is only required where the corridor is required to have a fire-resistance rating. Exception 1 has also been clarified regarding the allowable omission of smoke dampers so that smoke dampers may only be omitted if their operation would interfere with the operation of the smoke control system.

As Exception 1 is currently written, it would allow the omission of the smoke damper whenever a smoke control system is provided and the damper is not necessary for the operation of the system. This amendment provides for a fail/safe method of protection where smoke control systems are provided so that if the smoke control system fails for whatever reason, including loss of power, the smoke dampers will still be there to protect duct openings by actually closing upon power failure.

## Purpose and Rationale Statement for Work Group 9:M Occupancies Section 1203.5.1

#### **EXPRESS TERMS**

Add new subsection as follows:

#### **Section 1203 VENTILATION**

1203.5.1 Groups B, F, M, and S occupancies. In all buildings classified as Groups B. F. M, and S Occupancies or portions thereof where class I and II liquids are used, a mechanically operated exhaust system shall be provided sufficient to change one cubic foot of air per minute per square foot of floor area. Such exhaust ventilation shall be taken from a point near the floor level.

#### PURPOSE AND RATIONALE STATEMENT

(N) The purpose of this proposed amendment to Chapter 5 is to reasonably maintain the current level of fire/life safety provided by California Building Code (CBC) §1202.2.2 by requiring that adequate ventilation be provided to prevent the accumulation of vapors from flammable and combustible liquids in concentrations sufficient to represent a fire or explosion hazard.

Because of differences in occupancy descriptions and document layouts between the 2006 International Building Code (IBC) and the current CBC, this amendment is necessary in order to assure that occupancies that have incidental uses of certain volatile liquids be provided with the same level of life and fire safety that is in place under current state building standards.

The occupancies in question: Groups B, F, M and S, are intended by both the CBC and the IBC to contain uses and activities that do not represent an inherently high risk of fire or explosion. Therefore, these occupancy classes are not required by the IBC to be provided with the same protective level of construction and in-situ safety appliances as in more hazardous occupancy uses. This amendment continues the current CBC recognition that in otherwise low risk occupancies, some incidental use of flammable and combustible liquids may be necessary in support of the occupancies' routine activities.

**Express Terms** 

and

# Purpose and Rationale Statement for Work Group 9:M Occupancies

Table 503

#### **EXPRESS TERMS**

## TABLE 503 ALLOWABLE HEIGHT AND BUILDING AREAS<sup>a</sup> Height limitations shown as stories and feet above grade plane. Area limitations as determined by the definition of "Area, building," per story

			TYPE OF CONSTRUCTION							
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		Α	В	Α	В	Α	В	HT	Α	В
000110	HGT (feet)									
GROUP	HGT(S)	UL	160	65	55	65	55	65	50	40
M	S	UL	11	4	2	4	2	4	3	1
	Α	UL	UL	21,500	12,500	18,500	12,500	20,500	14,000	9,000

#### PURPOSE AND RATIONALE STATEMENT

**(SFM)** The purpose of this proposed amendment is to reasonably maintain the current level of fire/life safety provided by the CBC by reducing the allowable number of stories for Group M buildings constructed of Types IIB and IIIB construction from the current four stories contained in Table 503 of the 2006 IBC to two stories as currently allowed by the CBC.

It should be noted that the CBC has never allowed the non-fire-resistance rated types of construction, such as Types IIB and IIIB, as well as Type VB, to be greater than two stories in height for any occupancy unless they are protected throughout with an automatic sprinkler system. In that case, an additional story height is allowed for a total allowable height of three stories but then the designer cannot take advantage of the area increase that would otherwise be allowed with the installation of an automatic sprinkler system. So the total area of such buildings would be much less than would be the case if the additional stories were allowed as currently contained in Table 503 of the IBC.

A comparison of the calculations for determining the maximum allowable area permitted by both the CBC and the 2006 IBC based on taking advantage of the maximum increases permitted for both open space provided around the building and for the installation of automatic sprinklers, clearly shows the excessive allowable areas permitted by the IBC as compared to the CBC as follows:

CBC Types II-1 hour/III-1 hour (Types IIB/IIIB in the IBC) for Group M Occupancies allow a maximum height of two stories and a basic allowable area of 12,000 sq ft. The maximum allowable areas are:

2 stories	96,000 sq ft total	48,000 sq ft/story
3 stories	48,000 sq ft total	16,000 sq ft/story

In contrast, for the IBC Types IIB/IIIB construction for Group M Occupancies the maximum story height allowed is four stories and the basic allowable area is 12,500 sq ft. It should also be noted that an additional 20 ft in height may be added to the total height of the building, as well, when an automatic sprinkler system is provided. This results in the following maximum allowable areas:

2 stories	93,750 sq ft total	46,875 sq ft/story
3 stories	140,625 sq ft total	46,875 sq ft/story
4 stories	140,625 sq ft total	35,156 sq ft/story
5 stories	140,625 sq ft total	28,125 sq ft/story

From this comparison it is readily obvious that the IBC will allow significantly larger buildings for the nonrated types of construction (Types IIB and IIIB) than the CBC. Even more importantly is the fact that the IBC will allow these non-fire-resistance rated building construction types for Group M Occupancies to be as tall as five stories without any built-in fire-resistive construction for the structural members while still allowing approximately 50% more total floor area than that allowed for a two story building under the CBC and approximately three times the total area allowed for a three story building by the CBC.

This is of significant concern for Group M Occupancies which generally have relatively high fire loads, as well as high densities of occupants, especially on peak shopping days during the holidays. This represents a significantly greater risk to not only the life safety of the building occupants, but also to fire fighter safety and property protection. These taller and much larger buildings are totally relying on the automatic sprinkler system to provide the necessary protection. However, automatic sprinkler systems are not infallible. In fact, a recent NFPA study on the reliability of automatic sprinkler systems has shown that for Group M Occupancies, such systems fail to operate in approximately one out of every eight fires in sprinklered buildings where the fire was judged large enough to have caused the sprinkler system to operate.

This is even more critical in California where there is a high probability of a significant earthquake occurring which will render many sprinkler systems inoperable due to ruptured water mains in municipal water supply systems and/or broken or disjointed sprinkler risers and piping. Since it has been clearly indicated in the very large earthquakes which have occurred in California, that fires often follow earthquakes. These fires can be very devastating especially with a lack of water supplies and the inability of the fire service to gain access to many of the buildings because of the disruption caused by the earthquake and the overwhelming demands placed on the fire service by such disasters which limit the availability of their resources.

It is also interesting to note that both the IBC and the CBC consider buildings four stories or greater in height to represent additional risks for both fire and life safety. They both require exit stairway enclosures and shaft enclosures in such buildings to have their fire-resistance ratings increased from 1 hour to 2 hours. In such buildings it takes more time for the occupants to evacuate the building and fire fighting efforts become more difficult

because of the building height. By eliminating the minimum 1 hour fire-resistant construction that would otherwise be required throughout by the CBC for buildings of these heights, there is greater risk that the building may collapse prematurely when exposed to an uncontrolled fire, thus jeopardizing the life safety of the escaping occupants and putting fire fighters at greater risk, while also resulting in potentially much greater property losses.

Express Terms and

## Purpose and Rationale Statement

#### for Work Group 9:M Occupancies

#### Table 601

#### **EXPRESS TERMS**

## TABLE 601 FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (hours)

	TYPE I		TYPE II		TYPE III		TYPE IV <sup>d</sup>	TYP	ΕV
BUILDING ELEMENT	Α	В	A <sup>e</sup>	В	A <sup>e</sup>	В	HT	A <sup>e</sup>	В
Structural frame <sup>a</sup>	3	2	1	0	1	0	HT	1	0
Bearing walls Exterior <sup>g</sup> Interior	4b 3	4b 2	1	0	4b	4b 0	4b 1/HT	1	0
Nonbearing walls and partitions Exterior	See Table 602								
Nonbearing walls and partitions Interior <sup>f</sup>	0	0	0	0	0	0	See Section 602.4.6	0	0
Floor construction Including supporting beams and joists	2	2	1	0	1	0	HT	1	0
Roof construction Including supporting beams and joists	2 <sup>c</sup>	1°	1°	О°	1°	0	HT	1°	0

For SI: 1 foot = 304.8 mm.

- a. The structural frame shall be considered to be the columns and the girders, beams, trusses and spandrels having direct connections to the columns and bracing members designed to carry gravity loads. The members of floor or roof panels which have no connection to the columns shall be considered secondary members and not a part of the structural frame.
- b For building classified as Group B, F, M, S, or R occupancies, where the fire separation distance is 5 feet (1.6 m) or more, the minimum fire resistance rating of the exterior bearing walls shall be permitted to be 2 hours.
- c. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire retardant treated wood members shall be allowed to be used for such unprotected members.
- d. In all occupancies, heavy timber shall be allowed where a 1-hour or less fire-resistance rating is required.
- e. An approved automatic sprinkler system in accordance with Section 903.3.1.1 shall be allowed to be substituted for 1-hour fire-resistance-rated construction, provided such system is not otherwise required by other provisions of the code or used for an allowable area increase in accordance with Section 506.3 or an allowable height increase in accordance with Section 504.2. The 1-hour substitution for the fire resistance of exterior walls shall not be permitted.
- f. Not less than the fire-resistance rating required by other sections of this code.
- g. Not less than the fire-resistance rating based on fire separation distance (see Table 602).

#### PURPOSE AND RATIONALE STATEMENT

(SFM) The purpose of the proposed amendments to Table 601 is to reasonably maintain the current level of fire/life safety provided by the CBC by accomplishing the following:

- 1. Increase the minimum fire-resistance ratings required for exterior bearing walls in buildings of Types I, III, and IV construction to 4 hours where the fire separation distance is less than 5 feet for all occupancies and for buildings classified as Group A, E, H, or I Occupancies regardless of the fire separation distance.
- 2. Eliminate the allowance that permits a 1-hour reduction in the required fire-resistance ratings of the structural frame and bearing walls where supporting a roof only in Types IA and IB construction.
- 3. Eliminate the provisions that allow for the substitution of fire-retardant-treated wood for the roof structural elements and other elements of the roof construction in buildings of Types I and II construction (which would otherwise be required to be noncombustible) when the following conditions are met:
  - a. The building is two stories or less in height,
  - b. The building is of Type II construction and is greater than two stories in height, or
  - c. The building is of Type I construction and is greater than two stories in height and the vertical distance from the upper floor to the underside of the roof deck is at least 20 feet.

The 2006 International Building Code (IBC) requires exterior bearing walls in Types I, II, and III construction to have significantly lesser degrees of fire resistance than required in the California Building Code (CBC). Although it is difficult to make a direct comparison between the IBC and the CBC regarding the fire resistive requirements for exterior bearing walls because of the differences in the occupancy classifications and the fact that the CBC bases the requirements on occupancy, whereas the IBC does not, it becomes readily evident after a reasonably detailed evaluation that the ratings are significantly reduced. Generally speaking, the IBC only requires 2-hour fire resistive ratings for all the types of construction mentioned above except Type IA which specifies a minimum 3-hour fire resistance rating. In comparison, the CBC requires those exterior bearing walls to have a minimum 4-hour fire resistance rating.

These amendments will require those types of construction to have a higher fire resistance rating consistent with the concept of the higher fire resistance ratings for exterior walls in Table 5-A of the CBC. Exterior walls in Types I, III and IV construction have traditionally been required to have these higher fire resistance ratings by the CBC.

By allowing the structural frame, including columns and bearing walls, to be reduced by one hour for Types IA (CBC Type I-F.R.) and IB (CBC Type II-F.R.) construction, for one-story buildings, the actual construction type, in effect, becomes Types IB and IIA (CBC Type II-1 hour) respectively. Allowing the one-hour reduction is contrary to the concept of the structural frame which is intended to provide overall structural integrity to the building. This is accomplished through adequate fire resistive protection of the main bearing elements and the framing members that connect directly into the main bearing

elements in order to form a complete building structural envelope which will withstand the duration of fire to which it may be exposed based on the required fire resistance rating. The structural integrity of the building as a whole should be maintained during fire exposure conditions in order to prevent total collapse and should be provided regardless of building height or number of stories. This also provides additional safety for fire fighters that may have to go onto the roof to conduct fire fighting activities or ventilate the building.

Also, allowing the 1-hour reduction for a Type IB building, in effect, results in a Type IIA building of unlimited area. This is a very liberal allowance in the IBC which is inconsistent with the concepts of Table 601 and Table 503.

Presently, the CBC does not contain a similar provision to Footnote b to Table 601 of the IBC. The closest the CBC comes to this reduction is found in Section 508 which allows a one-hour reduction for the structural elements in buildings of Type II One-hour construction when such buildings are protected throughout with an approved automatic sprinkler system, when the system is not required by any other provisions of the code. It should be noted that such a reduction is presently permitted in the IBC without having to provide an automatic sprinkler system throughout the building. It should also be noted that Footnote d to IBC Table 601 provides the comparable one-hour reduction in the fire resistance ratings to that allowed by Section 508 of the UBC when automatic sprinklers are provided. So the trade-off is not lost with the deletion of Footnote b.

There is no technical supporting documentation to substantiate such a reduction in fire resistance for the structural elements supporting roofs in unsprinklered Type I construction buildings. We are especially concerned about the structural frame that ties the building together, and as such, is an integral structural unit under fire conditions. The basic requirement is that all portions of the entire structural frame need to have the same fire resistance rating in order for the building to maintain its overall structural integrity during a severe fire exposure. That is why there is a single line entry in Table 601 for the structural frame. Reducing the fire resistance of portions of the structural frame that supports the roof of a building will weaken the overall fire performance of the building by subjecting it to the possibility of premature structural collapse.

These proposed revisions more closely align the IBC with the 1997 UBC for the allowable reductions in the required fire resistance ratings for structural members supporting roofs. The reduction in roof ratings is an especially important issue to the local fire departments which must often access the roof for fire fighting purposes as well as to ventilate the building. Reducing the fire resistive protection for the roof structural elements beyond that presently allowed by the CBC would pose an additional risk to the fire fighters attacking fires in these potentially large buildings. Furthermore, roof construction in buildings required to be of noncombustible construction should not be allowed to have combustible elements, even if they are fire-retardant-treated wood, since they will still burn when exposed directly to fire. This can pose a similar risk to the local fire department by resulting in a premature failure of the roof construction during a fire. The allowable use of fire-retardant-treated wood in the roof construction would also add considerably more fire load to an otherwise noncombustible building.

and

Purpose and Rationale Statement

## for Work Group 9:M Occupancies Table 602

#### **EXPRESS TERMS**

## TABLE 602 FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE<sup>a, e</sup>

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP F-1, M, S-1
X < 5°	All	4f
5 ≤ X < 10	IA	2
	Others	2f
10 ≤ X < 30	IA, IB	1
	IIB, VB	1
	Others	1
X ≥ 30	All	0

For SI: 1 foot = 304.8 mm.

- a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.
- b. For special requirements for Group U occupancies see Section 406.1.2
- c. See Section 705.1.1 for party walls.
- d. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.
- e. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.
- f. Types II and V construction shall be allowed to have a minimum 1 hour fire-resistance rating.

#### PURPOSE AND RATIONALE STATEMENT

**(SFM)** The purpose of this proposed amendment is to reasonably maintain the current level of fire/life safety provided by the CBC by increasing the minimum fire-resistance rating requirements for exterior walls based on their fire separation distance as follows:

- 1. Where the fire separation distance is less than 5 feet, the fire-resistance rating is increased from 2 hours to 4 hours.
- 2. Where the fire separation distance is at least 5 feet but less than 10 feet, the required fire-resistance rating is increased from 1 hour to 2 hours.
- 3. Where the fire separation distance is at least 10 feet but less than 30 feet, the required fire-resistance rating is increased from zero to 1 hour for Types IIB and VB construction.

However, a new Footnote f is proposed to be added to Table 602 which allows buildings of Types II and V construction to have a minimum 1 hour fire-resistance rating for fire

separation distances less than 10 feet. This results in an actual reduction in the required fire-resistance rating from 2 hours to 1 hour in the 2006 IBC for fire separation distances less than 5 feet for these types of construction which is consistent with the CBC.

The 2006 International Building Code (IBC) Table 602 Fire-Resistance Rating Requirements For Exterior Walls Based on Fire Separation Distance specifies the fireresistance rating requirements for exterior walls, whether they are bearing or nonbearing, based on their fire separation distance as measured to property lines or imaginary property lines between buildings on the same property. Although this concept is similar to the CBC, the fire-resistance ratings are less. Also factored into the determination of the minimum required fire-resistance ratings of exterior walls is the occupancy classification of the building which relates to the potential fire severity that could occur in the building and thus expose an adjacent building should the fire break out of the windows. This is also similar to the approach taken in CBC Table 5-A. However, because the occupancy classifications of the two codes differ in many respects and because the break points for fire separation distances are different, it is somewhat difficult to make a direct comparison between the IBC and the CBC to see exactly how much less the required fire-resistance ratings are for exterior walls under the IBC as compared to the CBC. Nevertheless, such an analysis will reveal that, in general, the fire resistance ratings of exterior walls in the IBC are less and, in some instances significantly less, than those required in the CBC.

The CBC requires higher fire resistance ratings for exterior non-bearing walls for Types I, II-F.R., III, and IV construction (Types I, III, and IV construction according to the IBC). This change will require those types of construction to have higher fire resistance ratings consistent with the concept of the higher fire resistance ratings for exterior walls in Table 5-A of the CBC. Exterior walls in Types I, III and IV construction have traditionally been required to have these higher fire resistance ratings to protect against exterior fire exposures from adjacent buildings. This is especially important in California where there is a high probability that a significant seismic event will occur in the reasonably foreseeable future. Such an event will most likely rupture municipal water mains and building fires will shortly follow. Without adequate exterior wall fireresistance where buildings are relatively close to each other, there is a significant potential for building fires to spread to adjacent buildings, resulting in conflagrations. Since the fire departments may not have adequate water supplies to fight such fires, nor may they even be able to gain access to the buildings to conduct their operations due to disruptions caused by the earthquake, the fire resistive protection provided by the exterior walls becomes a very critical factor in preventing mass fires. Furthermore, there may not even be adequate fire department resources available to fight the many fires that may occur after a severe seismic event, since the fire departments will be stretched thin by the many demands placed on them to respond to the myriad of emergencies that will arise.